

WHAT IS CLAIMED IS:

- 1 1. A light generation device comprising:
2 a conducting substrate;
3 a lower electrode formed on said substrate;
4 a triangle mesa structure having an optical cavity formed on
5 said substrate for lateral light confinement wherein said mesa structure is
6 one selected from the group consisting of a triangle and a truncated triangle
7 mesa structure;
8 wherein said triangle mesa structure further comprises:
9 an active layer;
10 a lower conducting mirror and an upper conducting mirror for
11 vertical light confinement;
12 a contact layer formed on said upper conducting mirror; and
13 a metallic contact formed on said contact layer.

- 1 2. The device of claim 1 wherein:
2 said lower conducting mirror is one selected from the group
3 consisting of an n-type AlGaAs, InGaAsP and AlGaN semiconductor
4 superlattice; and
5 said upper conducting mirror is one selected from the group
6 consisting of a p-type AlGaAs, InGaAsP and AlGaN semiconductor
7 superlattice.

- 1 3. The device of claim 1 wherein light is generated in said active
2 layer that is vertically output through said metallic contact as a result of
3 applying an electrical current through said metallic contact which is linked to
4 said contact layer, said lower electrode, said lower mirror and said
5 conducting substrate.

1 4. The device of claim 1 wherein said active layer is made from
2 one selected from the group consisting of a double heterostructure, a single
3 quantum well (SQW), a multiple quantum well (MQW) and a current
4 asymmetric resonance tunneling structure.

1 5. The device of claim 1 wherein:
2 said substrate is a conducting n-GaAs substrate;
3 said optical cavity is a GaAs optical cavity;
4 said active layer is one selected from the group consisting of
5 InGaAs/GaAlAs double heterostructure, InGaAs/GaAlAs single quantum well,
6 InGaAs/GaAlAs multiple quantum wells, and a current asymmetric resonance
7 tunnelling structure;
8 said lower conducting mirror is made of an n-type AlGaAs
9 superlattice;
10 said upper conducting mirror is made of a p-type AlGaAs
11 superlattice; and
12 said upper contact layer is made of a p-type AlGaAs layer;
13 wherein said metallic contact is semitransparent.

1 6. The device of claim 1 wherein:
2 said substrate is a conducting n-InP substrate;
3 said optical cavity is one selected from said group consisting of
4 an InGaAsP optical cavity and an AlGaAsSb optical cavity;
5 said active layer is one selected from the group consisting of
6 InGaAsP/InGaAsP double heterostructure, InGaAsP/InGaAsP single quantum
7 well, InGaAsP/InGaAsP multiple quantum wells, and a current asymmetric
8 resonance tunnelling structure;

9 said lower conducting mirror is one selected from the group
10 consisting of an n-type InGaAsP/InGaAsP superlattice and an n-type
11 AlGaPSb/AlGaPSb superlattice;

12 said upper conducting mirror is one selected from the group
13 consisting of a p-type InGaAsP/InGaAsP superlattice and a p-type
14 AlGaPSb/AlGaPSb superlattice; and

15 said upper contact layer is made of a p-type InP cladding layer;
16 wherein said metallic contact is semitransparent.

1 7. The device of claim 1 wherein:

2 said substrate is a conducting n-GaAs substrate;

3 said optical cavity is a GaAs optical cavity;

4 said active layer is one selected from the group consisting of a
5 GaAsSb/GaAlAs double heterostructure, InGaAsN/GaAlAs double
6 heterostructure, GaAsSb/GaAlAs single quantum well, InGaAsN/GaAlAs
7 single quantum well, GaAsSb/GaAlAs multiple quantum wells,
8 InGaAsN/GaAlAs multiple quantum wells, and a current asymmetric
9 resonance tunnelling structure;

10 said lower conducting mirror is made of an n-type AlGaAs
11 superlattice;

12 said upper conducting mirror is made of a p-type AlGaAs
13 superlattice; and

14 said upper contact layer is made of a p-type AlGaAs layer;
15 wherein said metallic contact is semitransparent.

1 8. The device of claim 1 further comprising a sidewall deflector
2 having an optical grating on said substrate.

1 9. The device of claim 1 further comprising a cladding layer
2 wherein said lower conducting mirror serves as an interface between said
3 optical cavity and said cladding layer, and said upper conducting mirror
4 serves as an interface between said optical cavity and said contact layer.

1 10. The device of claim 9 wherein said cladding layer is one
2 selected from the group consisting of an n-type AlGaAs layer and an n-type
3 AlGaN_P layer.

1 11. The device of claim 1 wherein said conducting substrate is one
2 selected from the group consisting of n-GaAs, n-InP, n-SiC and sapphire.

1 12. The device of claim 1 further comprising a buffer layer made of
2 BAlGaN between said substrate and said triangle mesa structure.

1 13. The device of claim 12 further comprising a conducting n-GaN
2 layer between said buffer layer and said triangle mesa structure.

1 14. The device of claim 13 wherein:
2 said substrate is made of sapphire;
3 said optical cavity is an InGaAIN optical cavity;
4 said active layer is one selected from the group consisting of
5 InGaN/InGaAIN double heterostructure, InGaN/InGaAIN single quantum well,
6 InGaN/InGaAIN multiple quantum wells, and a current asymmetric resonance
7 tunnelling structure;
8 said lower conducting mirror is made of an n-type AlGaN
9 superlattice; and
10 said upper conducting mirror is made of a p-type AlGaN
11 superlattice;

12 wherein said metallic contact is semitransparent.

1 15. The device of claim 13 wherein:

2 said substrate is made of a conducting n-SiC substrate;

3 said optical cavity is an InGaAIN optical cavity;

4 said active layer is one selected from the group consisting of

5 InGaN/InGaAIN double heterostructure, InGaN/InGaAIN single quantum well,

6 InGaN/InGaAIN multiple quantum wells, and a current asymmetric resonance

7 tunnelling structure;

8 said lower conducting mirror is made of an n-type AlGaN
9 superlattice; and

10 said upper conducting mirror is made of a p-type AlGaN
11 superlattice;

12 wherein said metallic contact is semitransparent.

1 16. The device of claim 1 further comprising:

2 a buffer layer made of BAIGaInN on said substrate;

3 a conducting n-GaN layer on said buffer layer; and

4 a cladding layer between said conducting n-GaN layer and said
5 triangle mesa structure;

6 wherein said substrate is one selected from the group consisting
7 of n-SiC and sapphire.

1 17. The device of claim 16 wherein:

2 said optical cavity is an InGaAIN optical cavity; and

3 said active layer is one selected from the group consisting of

4 InGaN/InGaAIN double heterostructure, InGaN/InGaAIN single quantum well,

5 InGaN/InGaAIN multiple quantum wells, and a current asymmetric resonance

6 tunnelling structure;

7 wherein said lower conducting mirror serves as an interface
8 between said optical cavity and said cladding layer, and said upper
9 conducting mirror serves as an interface between said optical cavity and said
10 contact layer.

1 18. The device of claim 1 further comprising a mirror sidewall
2 deflector formed in or on said lower conducting mirror.

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